

feature of this eclipse, and were recorded by many observers at Sfax as being sinuous, undulating, and nearly parallel. They travelled at a rate equal to the average walking pace of a man (*Comptes rendus*, No. 14).

ATMOSPHERIC ORIGIN OF "SHADOW BANDS."—In No. 4049 of the *Astronomische Nachrichten* Signor T. Zona, of Palermo, suggests that the shadow bands observed during a total eclipse of the sun are of a purely atmospheric origin. He has observed that the rays of light projected from a man-of-war's searchlight on to a wall several kilometres from the ship exhibit just the same kind of light and dark bands that he observed at Sfax during the recent solar eclipse.

Similarly, he noticed that the light from Venus projected through a small window on to the opposite wall of the room in which he was seated exhibited the same appearance.

Signor Zona suggests that the atmospheric vibrations which cause the agitation seen at the sun's limb, when the latter is observed directly, are the cause of the oscillating bands seen during total eclipses.

A SPECTROGRAPHIC DETERMINATION OF THE SOLAR PARALLAX.—In Nos. 4048–9 of the *Astronomische Nachrichten* Herr F. Küstner describes in detail a method which he has employed to determine the sun's parallax spectrographically, from measurements of sixteen lines on each of eighteen spectrograms of Arcturus, obtained during the period June 24, 1904–January 15, 1905, with the Bonn spectrograph. From these measurements he found the radial velocity of Arcturus relative to the sun to be -4.83 ± 0.27 km. for the epoch 1904.8, and the value for the mean velocity of the earth to be 29.617 ± 0.057 km., the accepted value for the velocity of light in *vacuo* being 299865 ± 26 km. per second.

As the solar parallax previously accepted, viz. $8''\cdot800$, is based on the assumption that the earth's velocity is 29.765 km., and as these two quantities vary proportionally, it follows that with a more correct value for the latter a more refined value for the former may be determined.

Having made the determination, Herr Küstner arrives at the quantity $8''\cdot844 \pm 0''\cdot017$ as his final result for the value of the solar parallax.

NOVA AQUILÆ NO. 2.—The results of several recent observations of the Fleming Nova are published in No. 4049 of the *Astronomische Nachrichten*.

Prof. Wolf, observing on September 17 at 8h. 43m. (Konigstuhl M.T.), found the Nova's magnitude to be 9.6, showing a decrease of not quite 0.3 mag. since September 4.

Dr. Guthnick, observing at Bothkamp, obtained the photometric results shown in the following table:

1905	M.T. Berlin Mag.	1905	M.T. Berlin Mag.
Sept. 5 ... 8 gh. ... 10'32	Sept. 14 ... 8'3h. ... 10'47		
,, 8 ... 10'3h. ... 10'30	,, 19 ... 9'2h. ... 10'55		
,, 12 ... 10'1h. ... 10'40	,, 22 ... 9'3h. ... 10'66		
,, 13 ... 9 oh. ... 10'52	,, 23 ... 9'1h. ... 10'63		

The magnitudes are based on those given for the comparison stars in the Harvard photometric revision of the B.D. catalogue.

LIGHT-VARIATION OF SATURN'S SATELLITES.—From observations made on twelve evenings, Dr. P. Guthnick, of Bothkamp Observatory, has determined the phases of the magnitude changes of Tethys, Dione, Rhea, and Titan.

He found that the first named is brightest when at easterly elongation (90°) and faintest at about 330° . Dione reaches its maximum brightness at 90° and its minimum at about 40° . Rhea apparently has two maxima, one at 40° – 120° and a fainter one at 240° , the corresponding minima occurring at 180° and 330° respectively. The maximum brightness of Titan occurs at 240° , its minimum brightness at 20° . In regard to Japetus, Dr. Guthnick's observations confirm the results obtained by Prof. Pickering, viz. that the maximum brightness of that satellite occurs at the western, and the minimum at the eastern, elongation. The range of light-variation for each of the satellites Tethys, Dione, and Titan is about 0.75 mag., for Rhea about 1.0 mag., and for Japetus about 1.75 mag. (*Astronomische Nachrichten*, No. 4049).

INTERNATIONAL CONGRESS ON RADIOLOGY AND IONISATION.

THE first international congress for the study of radiology and ionisation, organised under the auspices of the Belgian Government, was held at Liège on September 12–14. The work of the congress was divided into two sections, devoted respectively to physical and biological science. The first section dealt with the following questions:—(1) physics of electrons, comprising also radiations of all kinds; (2) radio-activity and the accompanying transformations; (3) meteorological and astronomical phenomena attributable to ionisation, radio-activity, and to radiations of different kinds. The second section had for its scope the study of the physiological properties of the radiations and their application in medicine.

The opening session of the congress was held in the physics theatre of the University of Liège on September 12 under the presidency of Prof. Kuborn, member of the Royal Belgian Academy of Medicine. Among the members present may be named Profs. Becquerel, Bouchard, and Bergonié, representing the French Republic, Señor J. Muñoz del Castillo, officially representing Spain, Drs. E. F. Nichols and W. Dieffenbach (United States), Prof. Hurmuzescu (Roumania), Prof. Gillon (Italy), Dr. Yankorits (Servia), Lion Sy Thang (China), Dr. Arrago (Guatemala), Dr. Ortiz (Argentine). Prof. Lassar represented the Röntgen Association of Berlin, Prof. Onnen the Royal Society of Batavia, and Mr. Wilton the University of Adelaide, South Australia. The following were also present:—Messrs. Birkeland, Himstedt (Freiburg in B.), Gariel (Paris), and Legge (London).

Sir William Ramsay had intended to present an address on radio-thorium, but in his unavoidable absence it was read on his behalf. M. Becquerel gave a lecture on the analysis of the radiations of radio-active substances. The address will be published in the *Comptes rendus* of the congress, shortly to be issued by the organising committee (general offices, No. 1 Rue de la Prévôté, Brussels).

On September 13 a general meeting was held. Prof. Wind, of Utrecht, presented a communication on the diffraction and wave-length of the *n*-rays, and demonstrated the character of the apparatus designed by his colleague M. Haga and himself for the study of this much controversial question. Prof. Lassar, of Berlin, gave an account of the practical application of the new radiations. M. Tommasina, of Geneva, described a study of the radio-activity produced by atmospheric air (Elster and Geitel's phenomenon), and papers relating to the therapeutic action of the X-rays and of radium were read by Drs. Bergonié (Bordeaux), Dieffenbach (New York), and Kassabian (Philadelphia). The latter's hands, owing to their frequent exposure to the radiations used for therapeutic treatment, have during the past few years undergone characteristic changes.

The following papers of noteworthy interest were presented at later meetings:—Remarks relative to the terminology of ionisation, Prof. de Hemptinne (Louvain); disruptive discharge in gases at high pressures, Prof. Guye (Geneva); the spectroscopic study of radium light, Prof. Himstedt (Freiburg in B.); the kinetic theory of the electron serving as a basis for the electronic theory of radiation, Dr. Tommasina (Geneva); on the radio-active constituents of sediments from Echaillon and Salins-Moutiers, Dr. Blanc (Rome); a new apparatus for determining the radio-activity of spring-waters, Dr. H. Sieveking (Karlsruhe); Moser's radiations, Prof. Piltzschikoff (Kharkoff); discharge phenomena caused by X-rays and radium radiations, and the transformation of these rays, Prof. Hurmuzescu; critical observations on the theories of atomic disintegration and chemophysical dissociation, Prof. Muñoz del Castillo; the method of transmission of excited activity to the cathode, Mr. Makower (Manchester); radio-activity of the lava from Vesuvius (eruption of 1904), Dr. Tommasina; on the change of properties of the chemical elements, Prof. Fabinyi (Kolozsvár, Hungary); (1) the experimental methods of studying the transformations of the X-rays and the secondary rays resulting therefrom, (2) classification and mechanism of the different electric phenomena caused by the X-rays, Prof. Sagnac (Paris); absorption phenomena of radium and polonium

rays, Prof. Riecke (Göttingen), paper presented by Dr. Emil Bose.

Limitations of space prevent the enumeration of papers not read at the congress but accepted for insertion in the *Comptes rendus*, as well as of the communications read before the biological section. The final meeting of the congress was held on September 14. After several interesting communications had been read, including one from Sir William Huggins, presented by Prof. Becquerel, the following motion was put before the meeting by the executive of the congress, acting at the wish of Prof. Jose Muñoz del Castillo:—

The International Congress for the Study of Radiology and Ionisation assembled in plenary session at Liége on September 14, 1905, considers that, although State regulation and protection may sometimes impede free research among men of science, it is, however, necessary that Governments should, without creating monopolies, be brought to apply to radio-active substances the same legislative measures that prevent the monopolisation of other useful substances, and should guarantee by the play of economic laws free scientific research and the application of these substances to the treatment of the sick; and considers also that it is desirable to be able to advise or remind the Governments of the importance of these measures and that a permanent commission invested with powers by the actual congress, an assembly of men of science devoted to the study of these questions and belonging to different countries, would carry weight in discussing with public authorities matters appertaining to the needs of science or the requirements of the sick. It has therefore decided

(1) That an international commission for examining all questions of general interest relative to radio-active substances shall be instituted.

(2) That the commission shall meet regularly each year, and may be convened on any exceptional occasion by the president, acting with the majority of the executive.

(3) That it shall organise periodically international congresses, to meet every five years, and shall also be empowered to convene the congress in extraordinary session.

(4) That the members of this commission shall be subject to re-election at each meeting of the International Congress.

THE COALFIELDS OF NORTH STAFFORDSHIRE.

THE memoir described below¹ contains detailed accounts of the coalfields of North Staffordshire, especially those of the Pottery and Cheadle Coalfields. The re-survey on the 6-inch scale was commenced in 1898 and completed in 1901. The present volume, which contains detailed descriptions furnished by each geologist of the area surveyed by himself, has been largely written and edited by Mr. Gibson, who personally carried out the greater part of the field-work. It was pointed out by Beete Jukes long ago that, so far as the higher portions of the Coal-measures were concerned, North Staffordshire provided the type development of the Midlands. Mr. Gibson has now established in that region a definite stratigraphical sequence in the comparatively barren strata which conformably overlie the productive Coal-measures, and he has also proved that the same sequence may be recognised in the other coal-fields of the Midland area.

The chief points of interest are contained in chapter iv., which describes fully the determination of the Newcastle-under-Lyme group, the Etruria Marl group, and the Black Band group, and more particularly the removal of Hull's "Salopian Permian" into the Carboniferous. A full account of the paleontological and stratigraphical evidence on which this change is based is given at pp. 53 to 55. The evidence shows that the Salopian Permian of Staffordshire, Denbighshire, Worcestershire, Warwickshire, and in all probability Lancashire, occurs as the highest group of a definite sequence everywhere overlying the higher beds of the true Coal-measures, but never discordant to them,

¹ "Memoirs of the Geological Survey of England and Wales. The North Staffordshire Coalfields." By W. Gibson. With Contributions by G. Barrow, C. B. Wedd, and J. Ward. Pp. vii+494; with 1 Coloured Map and 6 Plates. (London: Edward Stanford, 1905.) Price 6s.

and that the Salopian Permian on either side of the Pennine Chain conforms to the Coal-measures, but is unconformably overlain on the eastern side by the Magnesian Limestone series.

It has been found advisable to adopt purely descriptive terms for various subdivisions, and for similar reasons the expressions Upper, Middle, and Lower Coal-measures have not been adopted, since the positions of the palaeontological boundary lines which give a definite significance to the terms have not been determined with accuracy. Since the memoir was written, Mr. R. Kidston has contributed a paper to the Geological Society on the divisions and correlation of the upper portions of the Coal-measures, in which he proposes the name "Staffordian" for the series included between the Black Band group and the Newcastle-under-Lyme group, while the Keele group and similar beds in the Midland coalfields, hitherto referred to the Permian system, are classed with the Radstock group, previously called Upper Coal-measures. The distribution of the plants certainly favours such a classification, but there is evidence which seems to show a gradual passage of one group into another, and Dr. Hind, who has devoted considerable attention to the study of the lamellibranchs, is not in favour of the proposed subdivision.

One of the most pleasing features is the accurate and complete description of the palaeontology, which is treated in detail by Mr. John Ward, and is accompanied by full lists, with six plates, of the common fossils of the Coal-measures. The Pottery Coalfield has long been recognised as an unrivalled field for the study of Carboniferous fishes, the study of which has to some extent overshadowed the examination of a numerous and varied series of molluscan remains and the equally abundant flora it has yielded. In this section Dr. W. Hind has given Mr. Ward a great deal of assistance. The fossil fishes have been named by Dr. Traquair and Dr. Smith Woodward, while the plants have been dealt with by Mr. Kidston. A complete geological bibliography of the North Staffordshire coalfields, covering fifteen pages, forms a valuable appendix.

The Triassic and Glacial deposits are described in separate chapters, and the economic products of the Pottery Coalfields are treated in chapter xii. The latter account includes the consideration of the future coal supply of the district from the concealed coalfield, to which considerable attention is paid. In addition descriptions are added of the local building stones, clays, and marls, supplemented by an enumeration of the chief source of water.

H. W. HUGHES.

THE DISTRIBUTION OF POWER.¹

TWENTY-SIX years ago, at the meeting of the British Association at Sheffield, August, 1879, a lecture, on "Electricity as a Motive Power," was delivered to some thousands of working men, and, for the first time, they realised that forks and spoons could not only be plated with the electric current, but could also be polished with a brush made to spin with the same agency.

The sea of upturned faces beamed with delight when Jack, their popular comrade, stepped on to the platform, took the newly plated spoon in his hands, and burnished it—a pair of thin wires tied to a church steeple being the only connecting link between the dynamo machine in a neighbouring works—ordinarily used there for electro-plating—and the electro-motor driving the polishing brush in the Albert Hall, Sheffield.

But an electro-motor is only a toy, thought my audience; nobody could construct an electro-motor that we could not stop with our hands; and at the end of my lecture they actually tried, and—wondered.

As far as I am aware, it was at that lecture that the following composite suggestion was first put forward—to obtain economy in electric transmission of power the current must be kept small, while to transmit much power the electric pressure between the conducting wires must be made large; and, lastly, to secure safety and convenience

¹ Lecture delivered on Tuesday, August 29, at a meeting of the British Association in Johannesburg, by Prof. W. E. Ayrton, F.R.S., and illustrated with many experiments on moving machinery, diagrams and lantern slides, two lanterns being used, in the American fashion, for enabling pictures to be contrasted on the screen.